

NCC 1980

'HYPERCHANNEL'



THE MISSING LINK

In the dawn of the computer industry, information processing was the primary computing function. As mass-storage-oriented systems evolved from serial batch processing systems, the era of information storage and retrieval had its beginning.

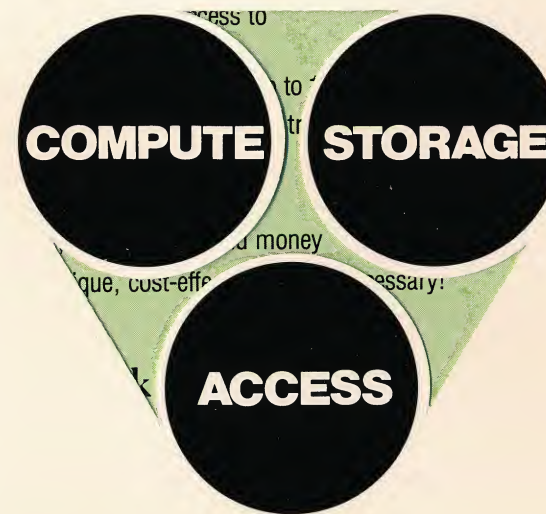
Later, data storage facilities were expanded and central processors were "front-ended" with a growing network of terminals for convenient access, thus introducing a totally new era — the era of information movement.

Characteristic of this new era is the trend toward separation of basic functions into unique, shared entities: **COMPUTE**, **STORAGE**, and **ACCESS**.

Coincident with the separation of functions, the demand for on-line, resource-shared information has created a tremendous amount of data traffic congestion between the unique entities. This, coupled with the severe and archaic limitations of conventional channel technology, has produced a large and explosively growing bottleneck.

An obvious product void existed; *until Network Systems Corporation*, there was no effective means of eliminating this bottleneck, nor of providing efficient handling of the voluminous data traffic between the unique **COMPUTE**, **STORAGE**, and **ACCESS** entities.

Network Systems Corporation has addressed this bottleneck problem with the novel and original utilization of state-of-the-art, high-speed components and advanced large systems architecture. By applying "*tomorrow's architecture today*," Network Systems' product family fills the void and provides the missing link to efficient, high-speed, cost-effective information movement.



THE MISSING LINK

In the dawn of the computer industry, information processing was the primary computing function. As mass-storage-oriented systems evolved from serial batch processing systems, the era of information storage and retrieval had its beginning.

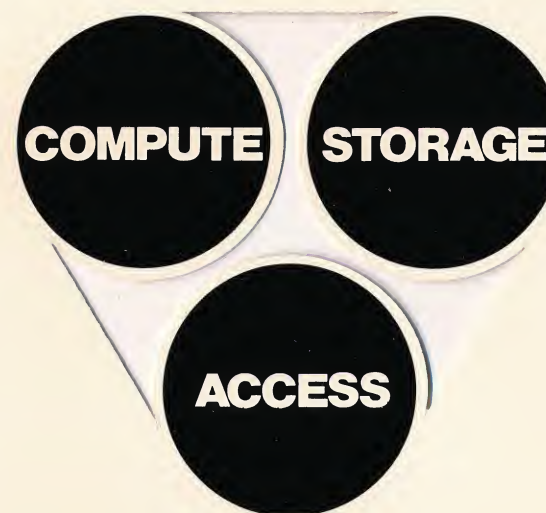
Later, data storage facilities were expanded and central processors were "front-ended" with a growing network of terminals for convenient access, thus introducing a totally new era — the era of information movement.

Characteristic of this new era is the trend toward separation of basic functions into unique, shared entities: **COMPUTE**, **STORAGE**, and **ACCESS**.

Coincident with the separation of functions, the demand for on-line, resource-shared information has created a tremendous amount of data traffic congestion between the unique entities. This, coupled with the severe and archaic limitations of conventional channel technology, has produced a large and explosively growing bottleneck.

An obvious product void existed; *until Network Systems Corporation*, there was no effective means of eliminating this bottleneck, nor of providing efficient handling of the voluminous data traffic between the unique **COMPUTE**, **STORAGE**, and **ACCESS** entities.

Network Systems Corporation has addressed this bottleneck problem with the novel and original utilization of state-of-the-art, high-speed components and advanced large systems architecture. By applying "*tomorrow's architecture today*," Network Systems' product family fills the void and provides the missing link to efficient, high-speed, cost-effective information movement.





HYPERchannel™

The Universal Channel

Combining high-speed digital switching technology and a sophisticated network data movement protocol, HYPERchannel™ provides an economical and effective solution to the multicomputer interconnect problem. The buffer storage and control circuitry of HYPERchannel totally decouples data movement from the internal workings of each attached device, creating a transparent asynchronous information transfer mechanism among multiple central processors, peripheral subsystems, and specialized processors.

HYPERchannel's unique architecture provides significant benefits, such as unparalleled high-speed communication, increased input/output performance of data channels and control units, and dynamic device reconfiguration with multipath access.

FEATURES

- High-speed local communication
 - Data transfer over HYPERchannel trunk is up to 50 million bits per second
 - Data transfer to channels is at maximum channel rates
 - Data transfer to peripherals is at the maximum peripheral unit rates
- Up to four independent, single coaxial data network trunks allow multiple, simultaneous data paths
- Multidrop capability (up to 64 HYPERchannel Adapters) on a single data trunk
- Dynamic switch capability allowing any processor to gain access to any other processor or peripheral device on the network
- Sophisticated network control logic
 - All protocol and data movement management is provided, as well as error detection and retransmission logic
- Sharing of resources between facilities that are located up to 1 mile away . . . or further if high-quality coaxial cable is utilized
- Device interconnection of virtually any manufacturer's equipment
- Significant data integrity and reliability due to immunity of coaxial data trunk to electrical noise

HYPERchannel™

Technology Plus

Network Systems Corporation has successfully taken the "network concept" and turned it into a practical reality by divorcing it from conventional data channel operation and implementing the advanced technology of very high-speed, bit-serial data transmission in real-world computing system environments. This extremely high-speed transmission technology is engineered into intelligent "nodes" (adapters) which interface to the system data channel and are coupled via high-speed coaxial cable (network data trunks).

HYPERchannel's unique network data trunk scheme combines the latest advances of data communications and high-performance electronics to provide:

- **HIGH PERFORMANCE**

The utmost in system performance is ensured by maximum trunk utilization with a unique demand-driven multiplexing scheme, optimum trunk allocation with a dynamic priority scheduling technique, and maximum utilization of all system components through the total decoupling of data flow.

- **HIGH RELIABILITY**

Reliability is ensured not only through Network Systems' careful selection of circuit components and careful attention to remaining conservatively within the performance capabilities of these components, but reliability is also ensured by the coaxial cable's immunity to electrical noise. Reliability is further enhanced with maximum error detection through efficient transmission protocol, complete cyclical redundant data checking, automatic retransmission, switch-regulated power supplies for voltage stability, and ac coupling to data trunks for power isolation.

- **NETWORK INTERCONNECTION**

A true network interconnection is accomplished by the timing isolation provided through self clocking, the physical addressing of both source and destination, and positive

access code control of the network, as well as by the unique coupling technique which creates virtually "zero" discontinuity on the trunk. The serial data channel implemented by HYPERchannel is "compatible" with all data channels and provides the most economical interconnect.

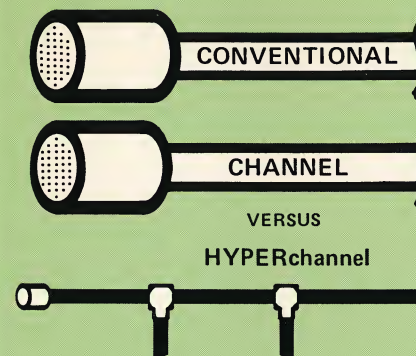
- **MAINTAINABILITY**

Careful attention was given to packaging and cooling requirements to ensure maximum mean-time-between-failure (MTBF). Network Systems also avoided the use of exotic circuitry and non-proven components, buying only standard and multi-sourced components to ensure continued supply and reliability. The HYPERchannel adapter is also designed with ease of maintenance in mind; the maximum commonality between the various models, as well as complete logical to physical mapping of adapter functions all serve to ensure minimum mean-time-to-repair (MTTR).

- **FLEXIBILITY**

The technically advanced design of HYPERchannel incorporates the utmost in modularity. All adapter models consist of a common trunk interface, control and data buffering, and microprocessor — with the device interface the only variant among adapter models. This modularity means that the HYPERchannel network can be easily customized, based on specific device requirements. As those requirements change, the adapters can easily be reconfigured to meet new objectives and take full advantage of the very latest advances in technology. Thus, new technology products serve to enhance and further expand the capabilities of the HYPERchannel network—they never obsolete it!

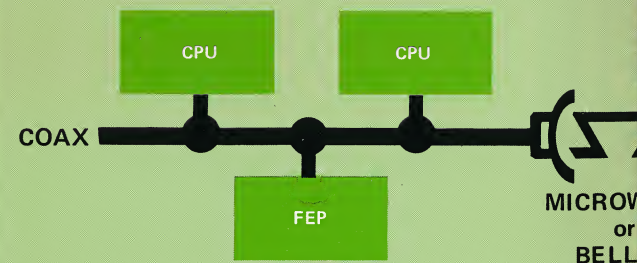
A NEW DATA CHANNEL



COAX CHARACTERISTICS

Cable Diameter	0.3"	0.6"
50 Mbit	1,000'	2,000'
25 Mbit	1,500'	3,000'
12 Mbit	2,000'	4,000'
6 Mbit	3,000'	6,000'
3 Mbit	4,000'	8,000'
1.5 Mbit	5,000'	10,000'

PLUS — TRUNK EXTENSION BY COMMERCIAL



INEL

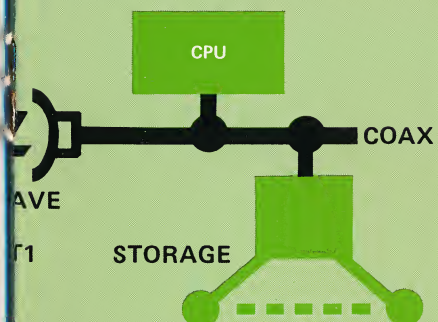
- 100 Plus twisted pair
- 12 Megabits per second
- 75 to 200 Feet
- Single thread

- Single Coax
- 50 Megabits per second
- 5000 Feet
- Multidrop

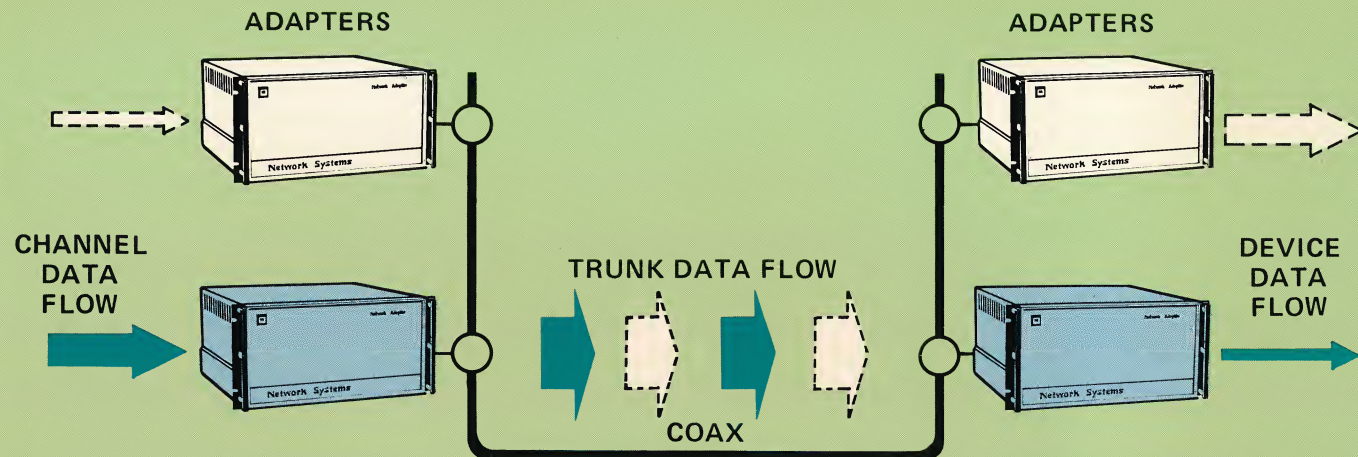
S

0.9"
4,000'
6,000'
8,000'
12,000'
16,000'
20,000'

WIDE BAND DATA LINKS



A NETWORK DESIGN SPECIFIC TO THE COMPUTING ENVIRONMENT



CIRCULAR DATA BUFFERING IN THE ADAPTERS

- Continuous data streams of any length
- Matching data rates of equipment
- Burst multiplexing of data trunks

CONTENTION ALLOCATION OF DATA TRUNKS

- Full bandwidth available to one transfer
- No single point of failure
- Insensitive to configuration

COMMUNICATIONS ENVELOPE & PROTOCOL

- Protection of data and control
- Full channel rates at several thousand feet

- Coordination of data rates, data acceptance and error handling

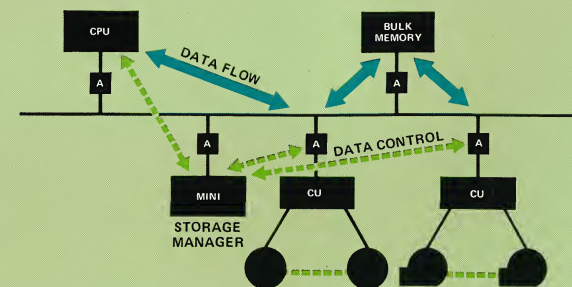
COAX CABLE — AC COUPLED AND SELF CLOCKING MODULATION

- Maximum noise rejection and reliability
- Power system isolation
- Timing isolation

ACCESS CODES

- Conversation privacy on shared trunks
- Logical segmentation of the network
- Creation of test environments

UNIQUE DATA FLOW/CONTROL



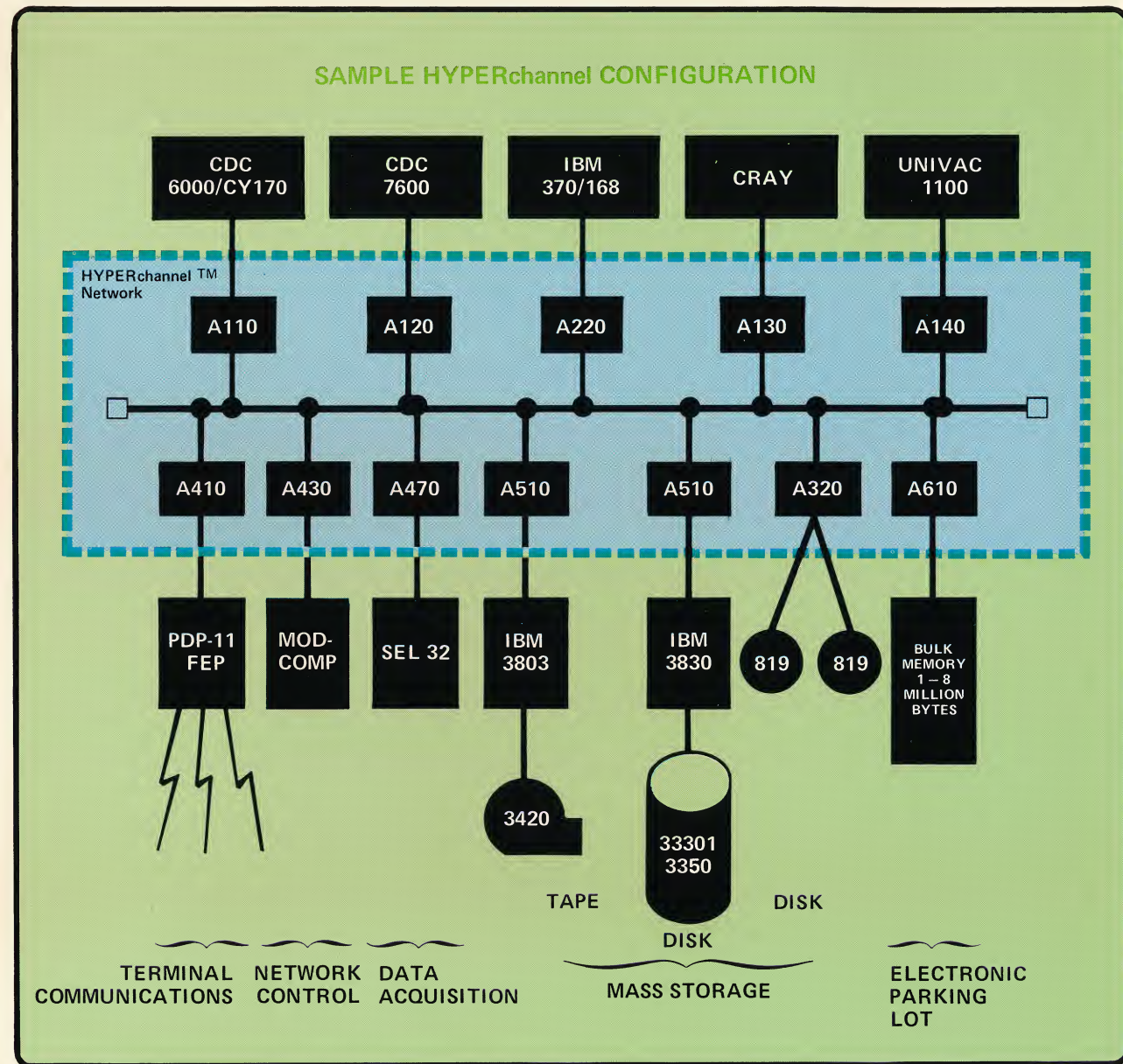
Remote Channel Adapters can be directed to receive/transmit I/O data directly with a third party.

Data flows directly between the CPU and storage devices under control of the minicomputer storage manager. Data can be staged between storage devices without the use of CPU memory for staging.

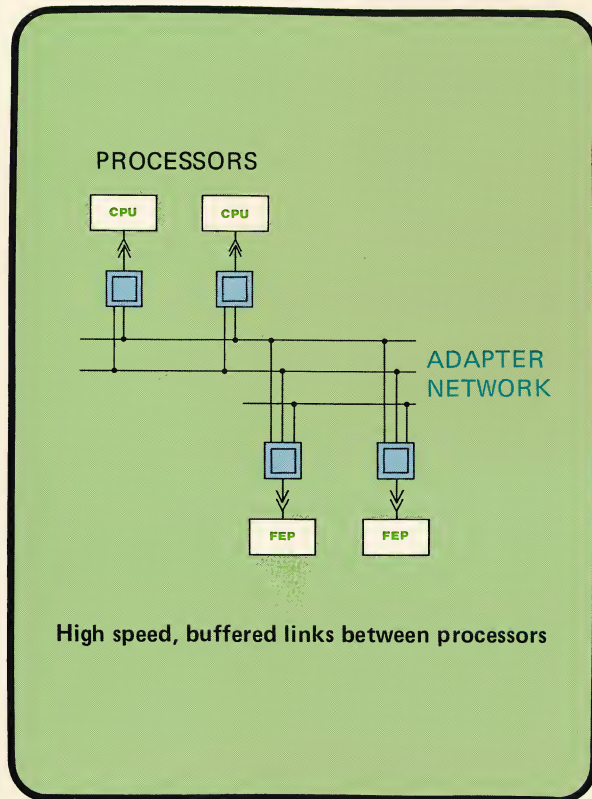
HYPERchannel™

The Answer to Tomorrow's Problems Today!

The flexibility and multiple utility of HYPERchannel enable computers in the large CPU to the small mini-computer range to share a very high-speed communication and interconnect facility unparalleled by conventional data channels. As such, HYPERchannel has a wide range of applications in creating an effective local computing installation. The application can vary from routine reconfiguration to intricate, sophisticated sharing of resources.



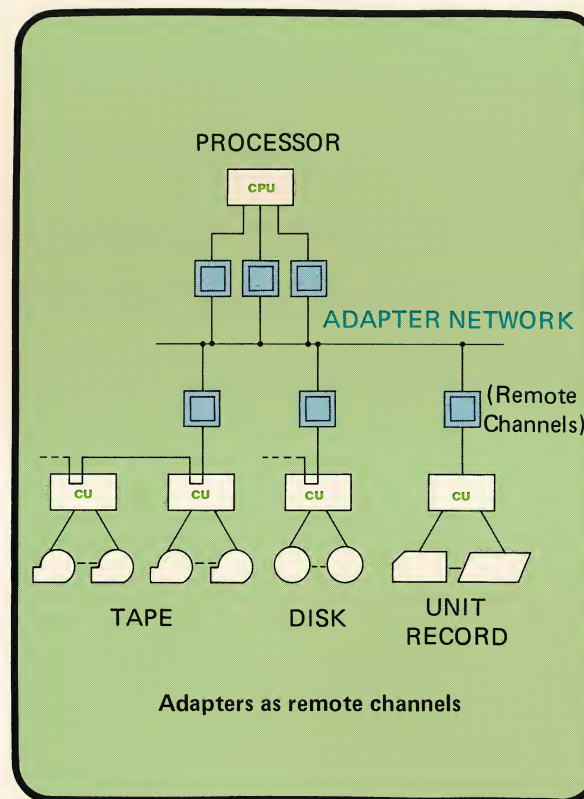
CPU – TO – CPU INTERCONNECTION



BENEFITS

- High-speed communications
- Matching of data rates (buffering)
- Virtually any manufacturer
- Significant reduction in CPU overhead associated with data transfers – Also less CPU memory buffering required

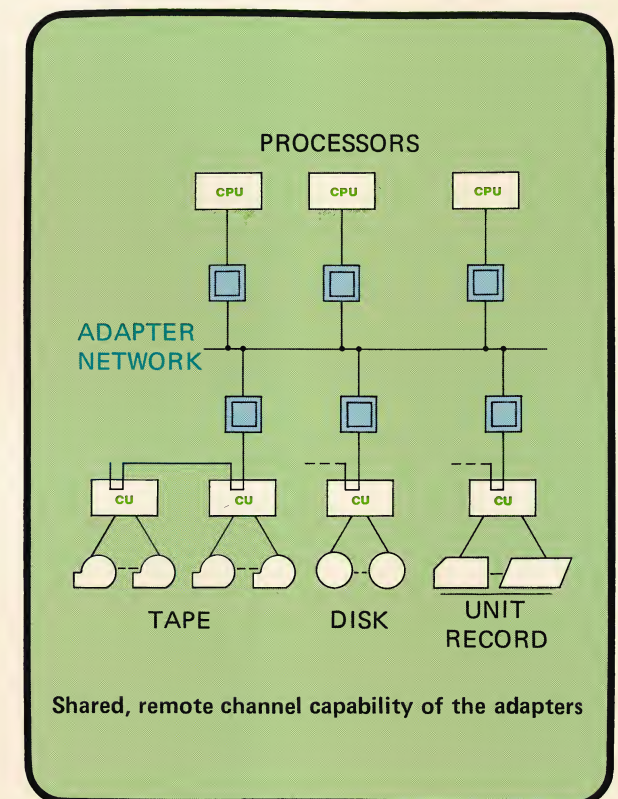
EXTENDED I/O CAPABILITY



BENEFITS

- Attachment of greater numbers of peripherals
- Efficient simultaneous operation of multiple peripherals
- Location of peripherals at greater distances from CPU
- Increased channel utilization (maximization of channel capacity)
- Access to same peripheral subsystem through multiple channel access

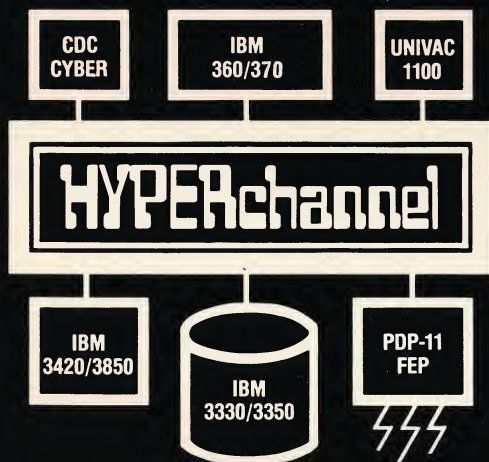
POOLING OF PERIPHERALS



BENEFITS

- Fewer peripherals per system
- Sharing of permanent/data files
- Keep pace with latest technology
- Better price/performance
- Easy, efficient implementation of hierarchical storage systems
- Multiplexing of I/O requests from multiple CPU's
- Efficient site layout & easy reconfiguration

**Can your
systems talk
to one another...
efficiently?**



**They can with
HYPERchannel™!**

Break the data flow logjam between multiple CPU's, peripheral subsystems, and specialized processors of mixed manufacturers. Through the sophisticated system architecture, control logic, and technology of HYPERchannel you get:

- Dynamic switching for CPU access to all other system elements
- Resource sharing between facilities up to 1 mile apart
- Data transfer up to 50 mbits over coax trunk
- Multiple, simultaneous data paths
- Up to 64 devices on single trunk
- Saved CPU time, channel time, and money

HYPERchannel is unique, cost-effective — and necessary!

Call or write today.



**Network Systems
Corporation**



**Network Systems
Corporation**

6820 Shingle Creek Parkway
Brooklyn Center, Minnesota 55430

Sales Offices:

Brooklyn Center, MN	612/566-5050
Chicago, IL	312/323-6240
San Francisco, CA	415/572-0331
Los Angeles, CA	213/863-4856
Huntsville, AL	205/539-7929
Dallas, TX	214/438-6464

Washington, D.C.	703/281-0455
Detroit, MI	313/569-1801
Philadelphia, PA	215/542-8039
New York, NY	201/368-8024
Boston, MA	617/843-6562



A new concept of speed.

Traditional thinking about connecting one computer to another has been limited by the technological barriers to data transmission. For example, channel-to-channel interface is possible only if central processors are of like manufacture and are located close enough to each other. If they are not, the usual option is local data communications, with a transmission "speed limit" of about 56,000 bits per second.

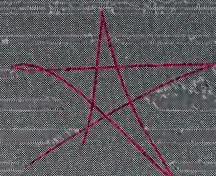
Large mainframes, like IBM 370's, UNIVAC and CDC systems, process data at over a million instructions per second. The tortoise pace of existing data transmission technology has created traffic jams and bottlenecks which prevent these systems from being used to their fullest potential.

Network Systems' HYPERchannel™ has broken through these barriers and initiated a new era in computer-to-computer communications. HYPERchannel allows almost any computer to talk to any other computer—regardless of manufacture. At distances up to a mile in a local mode.

And at speeds up to 50,000,000 bits a second.

Proven in over 60 major installations, HYPERchannel is a means of interconnecting mainframes and mini's and extending data channels. HYPERchannel is not only providing innovative solutions to data transmission problems, but is rapidly changing the way computer centers are designed.

If you have at least two large IBM 370's or their equivalent, write us. Or call our marketing services department (612) 425-2202. We want to help you get your computer room up to speed.



[NCC 80]



**Network Systems
Corporation**

7600 Boone Avenue North, Minneapolis, Minnesota 55428. TWX 910-576-1153.
Sales offices: Atlanta, Boston, Chicago, Detroit, Huntsville, Los Angeles,
New York, Philadelphia, San Francisco & Washington, D.C.